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(54) **METHOD FOR OPERATING A LASER SCANNER**

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***G06K 7/00*** (2006.01)

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CPC ..... ***G06K 7/0095*** (2013.01)

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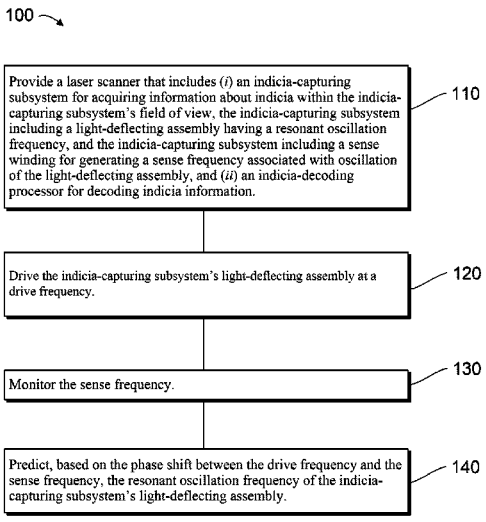
(57) **ABSTRACT**

A method for operating an indicia reader such as a laser scanner is provided. The method affords a simplified technique for monitoring the offset between the drive frequency and the resonant oscillation frequency of the laser scanner. The phase offset between the drive frequency and the sense frequency is monitored to derive the drive frequency's offset from the resonant oscillation frequency.

**13 Claims, 2 Drawing Sheets**



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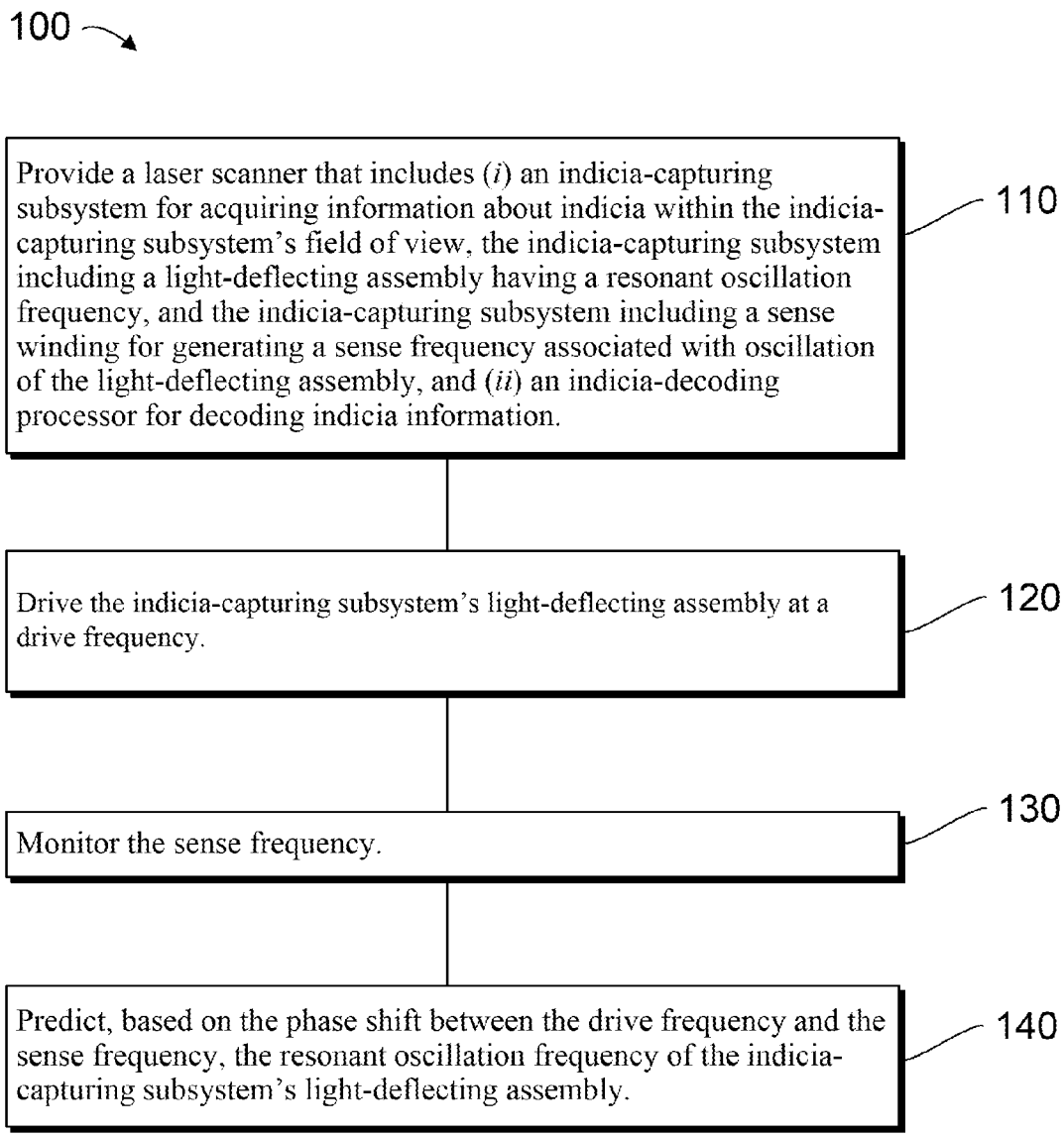
100
Provide a laser scanner that includes (i) an indicia-capturing subsystem for acquiring information about indicia within the indicia-capturing subsystem's field of view, the indicia-capturing subsystem including a light-deflecting assembly having a resonant oscillation frequency, and the indicia-capturing subsystem including a sense winding for generating a sense frequency associated with oscillation of the light-deflecting assembly, and (ii) an indicia-decoding processor for decoding indicia information.
110
Drive the indicia-capturing subsystem's light-deflecting assembly at a drive frequency.
120
Monitor the sense frequency.
130
Predict, based on the phase shift between the drive frequency and the sense frequency, the resonant oscillation frequency of the indicia-capturing subsystem's light-deflecting assembly.
140

FIG. 1

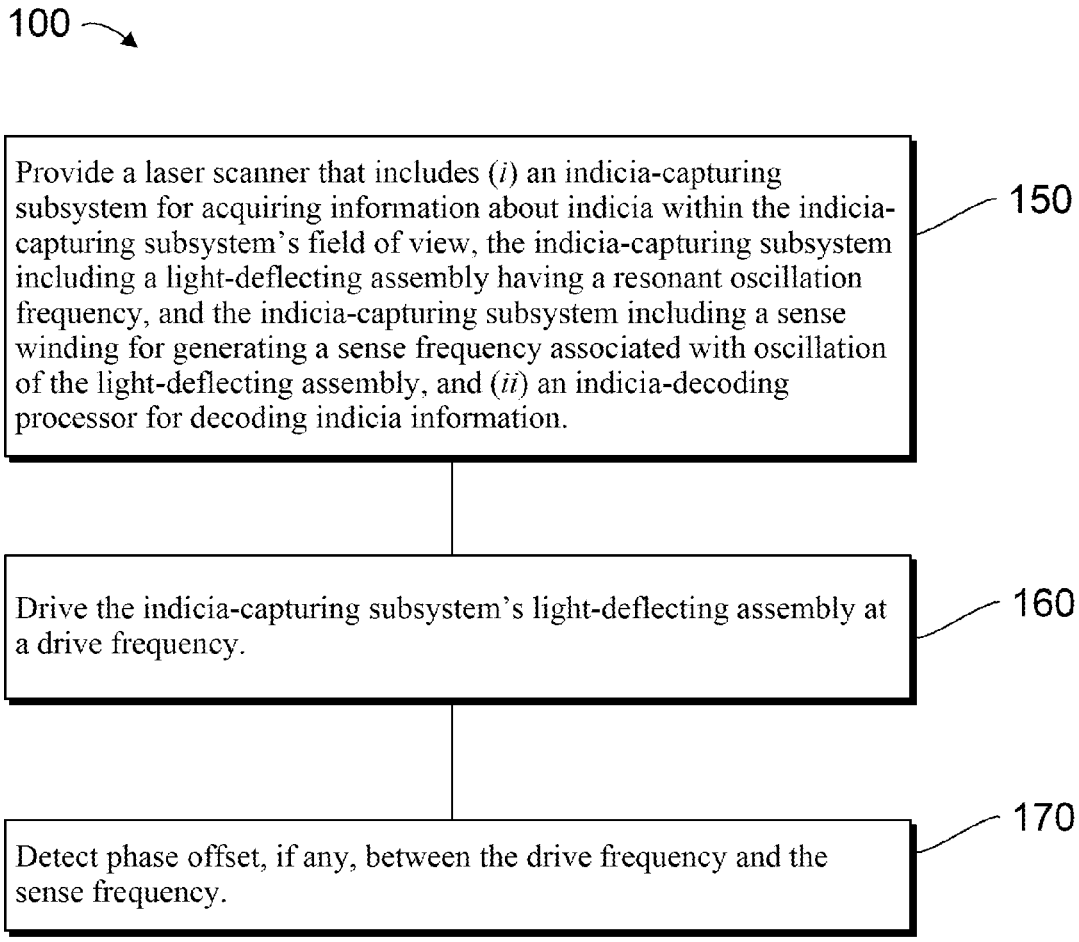
100
Provide a laser scanner that includes (i) an indicia-capturing subsystem for acquiring information about indicia within the indicia-capturing subsystem's field of view, the indicia-capturing subsystem including a light-deflecting assembly having a resonant oscillation frequency, and the indicia-capturing subsystem including a sense winding for generating a sense frequency associated with oscillation of the light-deflecting assembly, and (ii) an indicia-decoding processor for decoding indicia information.
150
Drive the indicia-capturing subsystem's light-deflecting assembly at a drive frequency.
160
Detect phase offset, if any, between the drive frequency and the sense frequency.
170

FIG. 2

# METHOD FOR OPERATING A LASER SCANNER

## FIELD OF THE INVENTION

The present invention relates to indicia readers. More particularly, the present invention relates to a method of operating laser scanners.

## BACKGROUND

Laser scanners are widely-used devices for decoding machine-readable indicia such as barcodes. Laser scanners typically operate by sweeping a laser beam across the laser scanner's field of view. If the field of view contains indicia (e.g., an indicium), the laser scanner receives the laser light that is reflected off the indicia and converts the optical signal into an electrical signal that can be decoded by the laser scanner.

To achieve the effect of sweeping the laser across the field of view, the laser scanner typically has a laser source directing a laser beam at an oscillating light-deflecting assembly. The light-deflecting assembly has a resonant oscillation frequency. Typically, it is desirable to drive the light-deflecting assembly at an oscillation frequency that is offset by some predetermined amount (e.g., 2 Hz, 0 Hz) from the resonant oscillation frequency. Achieving this desired offset has traditionally required repeated resonance testing of the light-deflecting assembly to determine its resonant frequency, which can change over time and temperature. This resonance testing technique can result in unwanted variation in selected drive frequency due to variation in the resonant frequency check method.

Therefore, a need exists for a method for operating an indicia reader that provides for a simplified, yet effective, technique of monitoring the relationship between the drive frequency and the resonant oscillation frequency of the light-deflecting assembly.

## SUMMARY

Accordingly, in one aspect, the present invention embraces a method for operating an indicia reader. A laser scanner is provided that includes an indicia-capturing subsystem for acquiring information about indicia within the indicia-capturing subsystem's field of view. The indicia-capturing subsystem includes a light-deflecting assembly having a resonant oscillation frequency. The indicia-capturing subsystem also includes a sense mechanism (e.g., sense winding) for generating a sense frequency associated with oscillation of the light-deflecting assembly. The laser scanner also includes an indicia-decoding processor for decoding indicia information. The indicia-capturing subsystem's light-deflecting assembly is driven at a drive frequency. The sense frequency of the indicia-capturing subsystem's light-deflecting assembly is monitored. The resonant oscillation frequency of the indicia-capturing subsystem's light-deflecting assembly is predicted based on the phase shift between the drive frequency and the sense frequency.

In an alternative embodiment, the step of predicting the resonant oscillation frequency of the indicia-capturing subsystem's light-deflecting assembly includes correlating the phase shift between the drive frequency and the sense frequency against established resonant-oscillation-frequency-offset values for the indicia-capturing subsystem's light-deflecting assembly.



In another embodiment, the method includes the step of monitoring the drive frequency of the indicia-capturing subsystem's light-deflecting assembly.

In yet another embodiment, the method includes the step of adjusting the drive frequency in response to the predicted resonant oscillation frequency of the indicia-capturing subsystem's light-deflecting assembly.

In yet another embodiment, the step of adjusting the drive frequency includes driving the indicia-capturing subsystem's light-deflecting assembly at an adjusted drive frequency that is closer to the predicted resonant oscillation frequency of the indicia-capturing subsystem's light-deflecting assembly.

In yet another embodiment, the step of adjusting the drive frequency includes driving the indicia-capturing subsystem's light-deflecting assembly at an adjusted drive frequency that is substantially the same as the predicted resonant oscillation frequency of the indicia-capturing subsystem's light-deflecting assembly.

In another aspect, the present invention embraces a method for operating an indicia reader where a laser scanner is provided that includes (i) an indicia-capturing subsystem for acquiring information about indicia within the indicia-capturing subsystem's field of view, the indicia-capturing subsystem including a light-deflecting assembly having a resonant oscillation frequency, and the indicia-capturing subsystem including a sense mechanism for generating a sense frequency associated with oscillation of the light-deflecting assembly, and (ii) an indicia-decoding processor for decoding indicia information. The indicia-capturing subsystem's light-deflecting assembly is driven at a drive frequency. Phase offset, if any, between the drive frequency and the sense frequency is detected.

In an alternative embodiment, the step of detecting phase offset between the drive frequency and the sense frequency includes monitoring the phase offset between the drive frequency and the sense frequency.

In another embodiment, the drive frequency is adjusted in response to phase offset between the drive frequency and the sense frequency.

In yet another embodiment, the step of adjusting the drive frequency includes modifying the drive frequency at which the indicia-capturing subsystem's light-deflecting assembly is driven to reduce the phase offset between the drive frequency and the sense frequency to a desired phase-offset setpoint.

In yet another embodiment, the resonant oscillation frequency of the indicia-capturing subsystem's light-deflecting assembly is determined based upon the phase offset between the drive frequency and the sense frequency.

In yet another embodiment, the drive frequency of the indicia-capturing subsystem's light-deflecting assembly is monitored.

In yet another embodiment, the sense frequency of the indicia-capturing subsystem's light-deflecting assembly is monitored.

The foregoing illustrative summary, as well as other exemplary objectives and/or advantages of the invention, and the manner in which the same are accomplished, are further explained within the following detailed description and its accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a flow chart illustrating an exemplary method for operating an indicia reader according to the present invention.

FIG. **2** is a flow chart illustrating an alternative exemplary method for operating an indicia reader according to the present invention.

## DETAILED DESCRIPTION

The present invention embraces a method for operating an indicia reader. Typically, the indicia reader is a laser scanner capable of scanning (e.g., reading) machine-readable indicia, such as barcodes, matrix codes, QR codes, etc. The method may apply to any indicia reader that utilizes a drive frequency to oscillate a light-deflecting assembly. The laser scanner may be a fixed-position scanner or a handheld scanner. Referring now to FIG. **1**, an exemplary embodiment of the method **100** according to the present invention is illustrated where a laser scanner is provided **110**. The laser scanner typically includes an indicia-capturing subsystem for acquiring information about indicia within the indicia-capturing subsystem's field of view. The indicia-capturing subsystem typically includes a light source such as a visible laser diode, and operates by sweeping a light beam (e.g., laser beam) across a field of view containing the indicia.

The kind of laser scanner that is embraced by the method according to the present invention achieves the sweeping action of the laser beam across the field of view by projecting a laser beam from a laser source onto a light-deflecting assembly. Typically the light-deflecting assembly includes a mirror to reflect the laser beam in the desired manner, but it may also include a light diffractive element such as a reflection or transmission hologram (i.e., HOE), a light-refractive element such as a lens element, or any other kind of optical element capable of deflecting a laser beam along an optical path. The light-deflecting assembly typically also includes a permanent magnet. Typically the mirror and permanent magnet are mounted to a scanning element (e.g., flipper) using an adhesive or another suitable fastening technique (e.g., soldering) **110**.

Typically, the light-deflecting assembly is forced into oscillatory motion (e.g., vibration) by driving an electromagnetic coil with a voltage signal having a frequency (i.e., drive frequency). Typically, the electromagnetic coil is driven in a push-pull mode in which the magnetic polarity of the coil reverses periodically at a rate determined by the amplitude variation of the voltage signal applied across the terminals of the electromagnetic coil. It will be appreciated by those having ordinary skill in the art that other techniques exist for oscillating the light-deflecting assembly of a laser scanner (e.g., electrodes). The method according to the present invention is not limited to scanners adopting any particular drive method. Rather, the method according to the present invention applies broadly to all laser scanners (or other scanners that operate by sweeping a light beam across a field-of-view that includes an indicium) that incorporate an oscillating light-deflecting assembly.

The laser scanner includes a photoreceptor (e.g., photodiode) that receives the light that reflects and/or scatters off the indicia as an optical signal; the laser scanner converts the optical signal into an electrical signal representing indicia information that can be read (e.g., decoded) by the laser scanner's indicia-decoding processor (e.g., computer processor) **110**.

According to the method **100** embraced by the present invention, the indicia-capturing subsystem's light-deflecting assembly is driven at a drive frequency **120**. Typically, upon startup or entering scan mode, the drive frequency is set at a predetermined, initial drive frequency (e.g., the default drive frequency). Typically, the initial drive frequency will be set at or near the predicted resonant oscillation frequency of the light-deflecting assembly. In general, the closer that a light-deflecting assembly is driven to its resonant oscillation frequency, the greater the efficiency (e.g., the less power required to drive the light-deflecting assembly). Typically, the hinge(s) (e.g., torsional hinges) that connect the light-deflecting assembly to a supporting structure act as torsional springs that resist deflection or rotation forces to return the light-deflecting assembly to its centered position. If the light-deflecting assembly is continuously driven at or near its resonant oscillation frequency, the deflection amplitude of the light-deflecting assembly can increase to a very wide angle. To a degree, this effect is advantageous, because it permits oscillation of the light-deflecting assembly over a large angle with a relatively low-power drive signal (e.g., lower voltage). If the deflection amplitude of the light-deflection assembly becomes too great, however, the hinges or other components may become overstressed and fail, or the light-deflecting assembly may collide with other components within the laser scanner (a failure commonly known as a bang). To avoid such failures, some devices are configured such that the initial drive frequency differs (i.e., is offset) from the resonant frequency of the light-deflecting assembly.

Setting the initial drive frequency at or near the resonant oscillation frequency requires a determination of the resonant oscillation frequency for a given light-deflecting assembly. This process has traditionally involved periodic resonance testing of the light-deflecting assembly. Incorporating resonance testing capabilities into the laser scanner tends to increase system startup time and decrease the overall user experience. Furthermore, resonance testing can introduce variation to the drive frequency from indicia reader to indicia reader due to variations in the resonant frequency check method. This resultant variation in initial drive frequencies across indicia readers is undesirable because such indicia readers are typically designed to operate at about the same drive frequency. Accounting for differences in drive frequencies across indicia readers introduces complexities into the engineering process and can lead to decreased indicia-reader performance in the field.

In lieu of performing traditional resonance testing of the light-deflecting assembly, the method **100** according to the present invention relies upon the predicted phase relationship of the drive frequency and oscillation frequency of the light-deflecting assembly to determine resonance. Typically, the oscillation frequency of the light-deflecting assembly is detected by a sense mechanism that, in combination with the movement of the light-deflecting assembly, generates a sense frequency. The sense mechanism is typically a sense winding that includes a wire coil of a particular gauge placed around the drive winding. The sense winding picks up an induced voltage caused by changing flux within the coil as a result of the external magnetic field generated by the permanent magnet portion of the light-deflecting assembly's scanning element. As such, the sense frequency generated by the interaction between the sense winding and the moving light-deflecting assembly measures the oscillation frequency of the light-deflecting assembly.

According to the present method **100** for operating an indicia reader, the sense frequency of the indicia-capturing subsystem's light-deflecting assembly is monitored to determine its relationship with the drive frequency **130**. Typically, for any given light-deflecting assembly, when the drive fre-

quency is in phase with the sense frequency, the drive frequency is operating substantially at the resonant oscillation frequency of the light-deflecting assembly. Consequently, the resonant oscillation frequency of the indicia-capturing subsystem's light-deflecting assembly may be predicted based on the phase shift (e.g., phase offset) between the drive frequency and the sense frequency **140**. For example, to drive the light-deflecting assembly closer to the resonant oscillation frequency, the drive frequency is adjusted to reduce the phase shift between the drive frequency and the sense frequency (e.g., make adjustments to bring the phase shift closer to 0 degrees). This results in an adjusted drive frequency that is closer to the predicted resonant oscillation frequency of the light-deflecting assembly.

In an alternative embodiment of the method **100** according to the present invention, the resonant oscillation frequency of the light-deflecting assembly is predicted by correlating the phase shift between the drive frequency and the sense frequency against established resonant-oscillation-frequency-offset values for the given light-deflecting assembly. Table 1 is an exemplary correlation table for an exemplary light-deflecting assembly. As shown in Table 1, for a given drive frequency, there is a corresponding phase shift representing the difference in phase, if any, between the drive frequency and the sense frequency. For example, when the drive frequency is set at 19.4 Hz for the exemplary light-deflecting assembly of Table 1, the corresponding phase shift between the drive frequency and sense frequency is 0.00 degrees. In other words, at a drive frequency of 19.4 Hz in this exemplary correlation table, the drive frequency and sense frequency are in phase (i.e., no phase shift), meaning that the drive frequency is operating at the resonant oscillation frequency of the light-deflecting assembly. The middle and right columns of Table 1 show the resonant-oscillation-frequency-offset values (measured in milliseconds and degrees, respectively) for the light-deflecting assembly exemplified in this correlation table. Typically, the resonant-oscillation-frequency-offset values for a given light-deflecting assembly are established by testing the phase shift at varying drive frequencies. Typically, the relevant resonant-oscillation-frequency-offset values for the laser scanner's light-deflecting assembly are stored in memory (e.g., non-volatile memory) so that they may be accessed during operation of the laser scanner.

An advantage of employing this correlation technique is that it allows for more precise determination of the appropriate drive setting to achieve the desired offset from the resonant oscillation frequency. For example and referring again to Table 1, if it is determined that the given light-deflecting assembly should be driven at a frequency that is 0.6 Hz from the resonant oscillation frequency, then the drive frequency should be maintained at the frequency that results in a phase shift of 24.92 degrees.

TABLE 1

A correlation table showing resonant-oscillation-frequency-offset values for an exemplary light-deflecting assembly.

| Drive Frequency (Hz) | Phase Shift (msec) | Phase Shift (deg) |
|---|---|---|
| 14.0 | 50.40 | −168.92 |
| 15.0 | 46.60 | −142.62 |
| 16.0 | 42.80 | −116.31 |
| 17.0 | 39.20 | −91.38 |
| 18.0 | 34.80 | −60.92 |
| 19.0 | 28.80 | −19.38 |
| 19.4 | 26.00 | 0.00 |

TABLE 1-continued

A correlation table showing resonant-oscillation-frequency-offset values for an exemplary light-deflecting assembly.

| Drive Frequency (Hz) | Phase Shift (msec) | Phase Shift (deg) |
|---|---|---|
| 20.0 | 22.40 | 24.92 |
| 21.0 | 17.60 | 58.15 |
| 22.0 | 14.40 | 80.31 |
| 23.0 | 12.40 | 94.15 |
| 24.0 | 11.60 | 99.69 |
| 25.0 | 10.80 | 105.23 |
| 26.0 | 10.40 | 108.00 |
| 27.0 | 9.60 | 113.54 |

Because the resonant oscillation frequency of a light-deflecting assembly can change over time (e.g., due to the effects of extreme temperatures and/or aging), it may be necessary to adjust the drive frequency to maintain the desired separation between the drive frequency and the resonant oscillation frequency. Rather than continually initiating a resonance test (e.g., upon system startup) that can affect the scanner's usability, the method **100** according to the present invention calls for the drive frequency to be adjusted in response to changes in the phase shift between the drive frequency and the sense frequency. So long as the phase shift is maintained at the appropriate offset, the drive frequency will be maintained at the desired offset from the resonant oscillation frequency, as predicted by the established resonant-oscillation-frequency-offset values for the given light-deflecting assembly. Similarly, should it be desirable to drive the light-deflecting assembly at substantially the same frequency as its resonant oscillation frequency, the drive frequency need only be adjusted so that the phase shift between the adjusted drive frequency and the sense frequency is about 0 degrees. To ensure the accuracy of the measurement of the phase shift, the drive frequency may be monitored as well.

Reference is now made to FIG. **2**. In an alternative embodiment, the present invention embraces a method for operating an indicia reader in which a laser scanner is provided **150** and the light-deflecting assembly of the laser scanner is driven at a drive frequency **160**. The phase offset, if any, between the drive frequency and the sense frequency is detected **170**. The phase offset may be detected by monitoring the phase offset between the drive frequency and the sense frequency. The drive frequency may be adjusted by modifying the drive frequency to reduce the phase offset between the drive oscillation frequency and the sense frequency to a desired setpoint (e.g., 20 degrees). The resonant oscillation frequency of the light-deflecting assembly may be determined by adjusting the drive frequency until the drive frequency and sense frequency are in phase (i.e., until the phase offset is 0 degrees), at which point the drive frequency will be equal to the resonant oscillation frequency.

To supplement the present disclosure, this application incorporates entirely by reference the following patents, patent application publications, and patent applications: U.S. Pat. Nos. 6,832,725; 7,159,783; 7,128,266; 7,413,127; 7,726,575; 8,390,909; 8,294,969; 8,408,469; 8,408,468; 8,381,979; 8,408,464; 8,317,105; 8,366,005; 8,424,768; 8,322,622; 8,371,507; 8,376,233; 8,457,013; 8,448,863; 8,459,557; 8,469,272; 8,474,712; 8,479,992; 8,490,877; U.S. Patent Application Publication No. 2012/0111946; U.S. Patent Application Publication No. 2012/0223141; U.S. Patent Application Publication No. 2012/0193423; U.S. Patent Application Publication No. 2012/0203647; U.S. Patent

Application Publication No. 2012/0248188; U.S. Patent Application Publication No. 2012/0228382; U.S. Patent Application Publication No. 2012/0193407; U.S. Patent Application Publication No. 2012/0168511; U.S. Patent Application Publication No. 2012/0168512; U.S. Patent Application Publication No. 2010/0177749; U.S. Patent Application Publication No. 2010/0177080; U.S. Patent Application Publication No. 2010/0177707; U.S. Patent Application Publication No. 2010/0177076; U.S. Patent Application Publication No. 2009/0134221; U.S. Patent Application Publication No. 2012/0318869; U.S. Patent Application Publication No. 2013/0043312; U.S. Patent Application Publication No. 2013/0068840; U.S. Patent Application Publication No. 2013/0070322; U.S. Patent Application Publication No. 2013/0075168; U.S. Patent Application Publication No. 2013/0056285; U.S. Patent Application Publication No. 2013/0075464; U.S. Patent Application Publication No. 2013/0082104; U.S. Patent Application Publication No. 2010/0225757; U.S. patent application Ser. No. 13/347,219 for an OMNIDIRECTIONAL LASER SCANNING BAR CODE SYMBOL READER GENERATING A LASER SCANNING PATTERN WITH A HIGHLY NON-UNIFORM SCAN DENSITY WITH RESPECT TO LINE ORIENTATION, filed Jan. 10, 2012 (Good); U.S. patent application Ser. No. 13/347,193 for a HYBRID-TYPE BIOPTICAL LASER SCANNING AND DIGITAL IMAGING SYSTEM EMPLOYING DIGITAL IMAGER WITH FIELD OF VIEW OVERLAPPING FIELD OF FIELD OF LASER SCANNING SUBSYSTEM, filed Jan. 10, 2012 (Kearney et al.); U.S. patent application Ser. No. 13/367,047 for LASER SCANNING MODULES EMBODYING SILICONE SCAN ELEMENT WITH TORSIONAL HINGES, filed Feb. 6, 2012 (Feng et al.); U.S. patent application Ser. No. 13/400,748 for a LASER SCANNING BAR CODE SYMBOL READING SYSTEM HAVING INTELLIGENT SCAN SWEEP ANGLE ADJUSTMENT CAPABILITIES OVER THE WORKING RANGE OF THE SYSTEM FOR OPTIMIZED BAR CODE SYMBOL READING PERFORMANCE, filed Feb. 21, 2012 (Wilz); U.S. patent application Ser. No. 13/432,197 for a LASER SCANNING SYSTEM USING LASER BEAM SOURCES FOR PRODUCING LONG AND SHORT WAVELENGTHS IN COMBINATION WITH BEAM-WAIST EXTENDING OPTICS TO EXTEND THE DEPTH OF FIELD THEREOF WHILE RESOLVING HIGH RESOLUTION BAR CODE SYMBOLS HAVING MINIMUM CODE ELEMENT WIDTHS, filed Mar. 28, 2012 (Havens et al.); U.S. patent application Ser. No. 13/492,883 for a LASER SCANNING MODULE WITH ROTATABLY ADJUSTABLE LASER SCANNING ASSEMBLY, filed Jun. 10, 2012 (Hennick et al.); U.S. patent application Ser. No. 13/367,978 for a LASER SCANNING MODULE EMPLOYING AN ELASTOMERIC U-HINGE BASED LASER SCANNING ASSEMBLY, filed Feb. 7, 2012 (Feng et al.); U.S. patent application Ser. No. 13/852,097 for a System and Method for Capturing and Preserving Vehicle Event Data, filed Mar. 28, 2013 (Barker et al.); U.S. patent application Ser. No. 13/780,356 for a Mobile Device Having Object-Identification Interface, filed Feb. 28, 2013 (Samek et al.); U.S. patent application Ser. No. 13/780,158 for a Distraction Avoidance System, filed Feb. 28, 2013 (Sauerwein); U.S. patent application Ser. No. 13/784,933 for an Integrated Dimensioning and Weighing System, filed Mar. 5, 2013 (McCloskey et al.); U.S. patent application Ser. No. 13/785,177 for a Dimensioning System, filed Mar. 5, 2013 (McCloskey et al.); U.S. patent application Ser. No. 13/780,196 for Android Bound Service Camera Initialization, filed Feb. 28, 2013 (Todeschini et al.); U.S. patent application Ser. No. 13/792,322 for a Replaceable Connector, filed Mar. 11, 2013 (Skvoretz); U.S. patent application Ser. No. 13/780,271 for a Vehicle Computer System with Transparent Display, filed Feb. 28, 2013 (Fitch et al.); U.S. patent application Ser. No. 13/736,139 for an Electronic Device Enclosure, filed Jan. 8, 2013 (Chaney); U.S. patent application Ser. No. 13/771,508 for an Optical Redirection Adapter, filed Feb. 20, 2013 (Anderson); U.S. patent application Ser. No. 13/750,304 for Measuring Object Dimensions Using Mobile Computer, filed Jan. 25, 2013; U.S. patent application Ser. No. 13/471,973 for Terminals and Methods for Dimensioning Objects, filed May 15, 2012; U.S. patent application Ser. No. 13/895,846 for a Method of Programming a Symbol Reading System, filed Apr. 10, 2013 (Corcoran); U.S. patent application Ser. No. 13/867,386 for a Point of Sale (POS) Based Checkout System Supporting a Customer-Transparent Two-Factor Authentication Process During Product Checkout Operations, filed Apr. 22, 2013 (Cunningham et al.); U.S. patent application Ser. No. 13/888,884 for an Indicia Reading System Employing Digital Gain Control, filed May 7, 2013 (Xian et al.); U.S. patent application Ser. No. 13/895,616 for a Laser Scanning Code Symbol Reading System Employing Multi-Channel Scan Data Signal Processing with Synchronized Digital Gain Control (SDGC) for Full Range Scanning, filed May 16, 2013 (Xian et al.); U.S. patent application Ser. No. 13/897,512 for a Laser Scanning Code Symbol Reading System Providing Improved Control over the Length and Intensity Characteristics of a Laser Scan Line Projected Therefrom Using Laser Source Blanking Control, filed May 20, 2013 (Brady et al.); U.S. patent application Ser. No. 13/897,634 for a Laser Scanning Code Symbol Reading System Employing Programmable Decode Time-Window Filtering, filed May 20, 2013 (Wilz, Sr. et al.); U.S. patent application Ser. No. 13/902,242 for a System For Providing A Continuous Communication Link With A Symbol Reading Device, filed May 24, 2013 (Smith et al.); U.S. patent application Ser. No. 13/902,144, for a System and Method for Display of Information Using a Vehicle-Mount Computer, filed May 24, 2013 (Chamberlin); U.S. patent application Ser. No. 13/902,110 for a System and Method for Display of Information Using a Vehicle-Mount Computer, filed May 24, 2013 (Hollifield); U.S. patent application Ser. No. 13/912,262 for a Method of Error Correction for 3D Imaging Device, filed Jun. 7, 2013 (Jovanovski et al.); U.S. patent application Ser. No. 13/912,702 for a System and Method for Reading Code Symbols at Long Range Using Source Power Control, filed Jun. 7, 2013 (Xian et al.); U.S. patent application Ser. No. 13/922,339 for a System and Method for Reading Code Symbols Using a Variable Field of View, filed Jun. 20, 2013 (Xian et al.); U.S. patent application Ser. No. 13/927,398 for a Code Symbol Reading System Having Adaptive Autofocus, filed Jun. 26, 2013 (Todeschini); U.S. patent application Ser. No. 13/930,913 for a Mobile Device Having an Improved User Interface for Reading Code Symbols, filed Jun. 28, 2013 (Gelay et al.); U.S. patent application Ser. No. 13/933,415 for an Electronic Device Case, filed Jul. 2, 2013 (London et al.); and U.S. patent application Ser. No. 13/947,296 for a System and Method for Selectively Reading Code Symbols, filed Jul. 22, 2013 (Rueblinger et al.).

In the specification and/or figures, typical embodiments of the invention have been disclosed. The present invention is not limited to such exemplary embodiments. The use of the term "and/or" includes any and all combinations of one or more of the associated listed items. The figures are schematic representations and so are not necessarily drawn to scale.

Unless otherwise noted, specific terms have been used in a generic and descriptive sense and not for purposes of limitation.

The invention claimed is:

**1**. A method for operating an indicia reader, comprising:

providing a laser scanner that includes (i) an indicia-capturing subsystem for acquiring information about indicia within the indicia-capturing subsystem's field of view, the indicia-capturing subsystem including a light-deflecting assembly having a resonant oscillation frequency, and the indicia-capturing subsystem including a sense mechanism for generating a sense frequency associated with oscillation of the light-deflecting assembly, and (ii) an indicia-decoding processor for decoding indicia information;

driving the indicia-capturing subsystem's light-deflecting assembly at a drive frequency;

monitoring the sense frequency; and

predicting, based on the phase shift between the drive frequency and the sense frequency, the resonant oscillation frequency of the indicia-capturing subsystem's light-deflecting assembly.

**2**. The method according to claim **1**, wherein the step of predicting the resonant oscillation frequency of the indicia-capturing subsystem's light-deflecting assembly comprises correlating the phase shift between the drive frequency and the sense frequency against established resonant-oscillation-frequency-offset values for the indicia-capturing subsystem's light-deflecting assembly.

**3**. The method according to claim **1**, comprising the step of monitoring the drive frequency of the indicia-capturing subsystem's light-deflecting assembly.

**4**. The method according to claim **1**, comprising the step of adjusting the drive frequency in response to the predicted resonant oscillation frequency of the indicia-capturing subsystem's light-deflecting assembly.

**5**. The method according to claim **4**, wherein the step of adjusting the drive frequency comprises driving the indicia-capturing subsystem's light-deflecting assembly at an adjusted drive frequency that is closer to the predicted resonant oscillation frequency of the indicia-capturing subsystem's light-deflecting assembly.

**6**. The method according to claim **4**, wherein the step of adjusting the drive frequency comprises driving the indicia-capturing subsystem's light-deflecting assembly at an adjusted drive frequency that is substantially the same as the predicted resonant oscillation frequency of the indicia-capturing subsystem's light-deflecting assembly.

**7**. A method for operating an indicia reader, comprising:

providing a laser scanner that includes (i) an indicia-capturing subsystem for acquiring information about indicia within the indicia-capturing subsystem's field of view, the indicia-capturing subsystem including a light-deflecting assembly having a resonant oscillation frequency, and the indicia-capturing subsystem including a sense mechanism for generating a sense frequency associated with oscillation of the light-deflecting assembly, and (ii) an indicia-decoding processor for decoding indicia information;

driving the indicia-capturing subsystem's light-deflecting assembly at a drive frequency; and

detecting phase offset, if any, between the drive frequency and the sense frequency.

**8**. The method according to claim **7**, wherein the step of detecting phase offset between the drive frequency and the sense frequency comprises monitoring the phase offset between the drive frequency and the sense frequency.

**9**. The method according to claim **7**, comprising the step of adjusting the drive frequency in response to phase offset between the drive frequency and the sense frequency.

**10**. The method according to claim **9**, wherein the step of adjusting the drive frequency comprises modifying the drive frequency at which the indicia-capturing subsystem's light-deflecting assembly is driven to reduce the phase offset between the drive frequency and the sense frequency to a desired phase-offset setpoint.

**11**. The method according to claim **7**, comprising the step of determining the resonant oscillation frequency of the indicia-capturing subsystem's light-deflecting assembly based upon the phase offset between the drive frequency and the sense frequency.

**12**. The method according to claim **7**, comprising the step of monitoring the drive frequency of the indicia-capturing subsystem's light-deflecting assembly.

**13**. The method according to claim **7**, comprising the step of monitoring the sense frequency of the indicia-capturing subsystem's light-deflecting assembly.

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